

ABSTRACT

A multi-stratum multi-timescale control for self-governing networks provides automatic adaptation to temporal and spatial traffic changes and to network state changes. Microsecond timescale reacting through the routing function, a facet of the lowest stratum, allows a source node to choose the best available route from a sorted list of routes, and to collect information on the state of these routes. Millisecond timescale correcting through the resource allocation function, a facet of the intermediate stratum, allows the network to correct resource allocations based on requirements calculated by the routing function. Long-term provisioning through the provisioning function at the higher stratum allows the network to recommend resource augmentations, based on requirements reported by the resource allocation function. The control is implemented in the network through coordination across edge node controllers, core node controllers, and network controllers. Metrics based on automated measurements of network performance are used by the control to adjust network resources. The Routing index is collected by the routing function and is the average rank of the selected route within a route-set. The routing function also collects measurements on route Constituent Traffic, which quantifies traffic in each of three categories: (carried) first-class, (carried) secondary, and rejected. The Resource Allocation Index is a metric collected by the resource allocation function. It quantifies the number of failures in re-allocating resources. In another aspect of this invention, a provisioning method is provided, which recommends appropriate link capacity increments based on the afore-mentioned Constituent Traffic measurements, and based on rules provided by the network operator.